

## Ecology: The Biotic and Abiotic Environment

**7-4 The student will demonstrate an understanding of how organisms interact with and respond to the biotic and abiotic components of their environments. (Earth Science, Life Science)**

**7.4.3 Explain the interaction among changes in the environment due to natural hazards (including landslides, wildfires, and floods), changes in populations, and limiting factors (including climate and the availability of food and water, space, and shelter).  
Taxonomy level: 2.7-B Understand Conceptual Knowledge**

**Previous/Future knowledge:** In 3<sup>rd</sup> grade (3-2.4), students explained how changes in the habitats of plants and animals affect their survival. In 5<sup>th</sup> grade (5-2.5), students explained how limiting factors (including food, water, space, and shelter) affect populations in ecosystems.

**It is essential for students to** know that there are various factors that can change the environment. These factors, which include natural hazards, changes in populations, and limiting factors, all have similar effects on the environment, and can affect each other. These changes can have an effect on the amount of resources available in the environment. This can lead to competition for food, water, space, or shelter.

Changes in the environment can occur due to *natural hazards*.

### *Landslides*

- Landslides are large areas of ground movement of rock, earth, or debris that fall, slide, or flow on slopes due to gravity.
- They can occur in any environment given the right conditions of soil, moisture, and the angle of slope.
- Landslides can be caused by rains, floods, earthquakes, and other natural causes, as well as human-made causes such as excessive development or clear-cutting for lumber.
- Some examples of ways that landslides can effect the environment are blocking roads, damaging or destroying homes, destroying habitats, or disrupting power lines.

### *Wildfires*

- Fire is a natural event in most grassland and forest ecosystems.
- Fires can be beneficial to the ecosystem and are an essential component in the life cycle of some trees.
- Generally, fires are neither good nor bad. They occur naturally through lightning strikes or when humans start them accidentally or intentionally.
- Some examples of the effects of wildfires on the environment are: ability of some seeds to break open so they can germinate, an increase in air pollution, habitat destruction, or destroying homes or property.

### *Floods*

- A flood is an unusually high water stage in which water overflows its natural or artificial banks onto normally dry land.
- There are two basic types of floods.
  - In a regular river flood, water slowly climbs over the edges of a river.
  - The more dangerous type, a flash flood, occurs when a wall of water quickly sweeps over an area. Some examples of factors that contribute to flooding are

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- heavy, intense rainfall
- over-saturated soil (when the ground cannot hold anymore water)
- high river, stream or reservoir levels caused by unusually large amounts of rain
- urbanization, or lots of buildings and parking lots
- Some examples of the effects of floods on the environment may include damaging property, endangering humans and animals, or causing soil erosion and deposition of sediment and nutrients and creation of fertile soil.

Changes in the environment can occur due to *changes in populations*. Changes in populations can occur when new members enter a population or when members leave a population. This will have an effect on the *population density* (the number of organisms in the given amount of space) for a particular area.

### *Births and Deaths*

- New births are the main way that organisms are added to a population.
- The number of births in a population during a certain amount of time is called the *birth rate*.
- Deaths are the main way that organisms leave a population.
- The number of deaths in a population during a certain amount of time is called the *death rate*.

### *Immigration & Emigration*

- The size of the population can change when members move into or out of the population.
- *Immigration* is when organisms move in from another environment.
- When part of the population leaves the environment, this is known as *emigration*.

Changes in the environment can occur due to *limiting factors*. These limiting factors can affect the number of organisms an environment can support. The maximum number of organisms that can survive in a particular ecosystem is known as the *carrying capacity*.

### *Climate*

- Climate refers to the temperature and amount of rainfall in a particular environment. Changes in temperature and the amount of rainfall from what is normal for that area can change an environment, which will have an effect on the populations in the area.

### *Availability of food, water, space, and shelter*

- Organisms require a certain amount of food water, space, and shelter in order to survive and reproduce.
- When the availability of the amount of any of these resources in a given area is less than what the various populations need, it becomes a *limiting factor*.
- When plants and animals compete for these resources, some will get them and some will not.
- Those that get the resources survive. Those that do not, will move to where the resources are available or die.

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**It is not essential for students to** know how the interrelationships of organisms create stability in an environment, ecological succession, characteristics of specific climate regions (biomes), or how human activities affect the environments.

### **Assessment Guidelines:**

The objective of this indicator is to *explain* the interactions among changes in the environment; therefore, the primary focus of assessment should be to construct a cause-and-effect model of the various ways that natural hazards, changes in populations, and limiting factors affect the environment. However, appropriate assessments should also require students to *exemplify* ways that the landslides, wildfires, and floods affect the environment; *compare* ways in which population sizes can change; *summarize* how the availability of resources can affect a population; or *recognize* changes in the environment as due to a natural hazard, population changes, or limiting factors.